

# **FINAL REPORT**

**RONALD E. MCNAIR  
GRADUATE STUDENT RESEARCHERS PROGRAM**

**(NASA GRANT #: NAG2 – 6028)**

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## **1. PROGRAM SUMMARY**

North Carolina A&T State University was authorized to implement the Ronald E. McNair Graduate Research Fellowship Program (REMGRFP) beginning the Fall Semester of 1996. Its goal is to increase the participation numbers of "*Socially and economically disadvantaged students and individuals with disabilities, with special emphasis on those students historically underrepresented in NASA programs (disadvantaged students).*" This provides opportunities for socially and economically students to pursue doctoral degrees in engineering through a support program which gives financial assistance and encourages summer internships. The program is consistent with the National Education Goals and America 2000, which serve as the guides to planning and programmatic activities of the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET). More specifically, the REMGRFP ensures the availability of a diverse and highly trained scientific and technical workforce by increasing the participation of the segments of our society underrepresented in the advanced technology arenas. According to the report by the National Science Foundation, only 97 out of 6,052 Ph.D. awardees in Engineering in 1997 were African-Americans. 3,281 Ph.D. degrees were awarded to US citizens or permanent residents in the same year. In 2000 the statistics for African-Americans were worse because only eighty-three (83) African-Americans were awarded Ph.D.s.

North Carolina A&T State University (NC A&T), which has been the number one producer of African American engineers in the nation for many years, launched its Ph.D. programs in Electrical Engineering and Mechanical Engineering in 1995 and in Industrial Engineering in 2000. The Ronald E. McNair Graduate Research Fellowship Program has been supporting thirty-four (34) doctoral students since 1996, including thirteen (13) current minority fellows. This NASA Program was also able to make history by awarding Ph.D. degrees to three (3) African-American students at NC A&T in 1998.

## **2. MILESTONE AND ACCOMPLISHMENTS**

The Ronald E. McNair Graduate Research Fellowship Doctoral Program reached its first milestone on May 9, 1998. The North Carolina A&T State University's 107<sup>th</sup> Annual Commencement Ceremony culminated with the hooding of three (3) Ronald E. McNair Ph.D. Fellows. Dr. Alfred Burress and Dr. Sidney Bryson earned doctorates in Electrical Engineering and Dr. Christopher Grace earned a doctorate in Mechanical Engineering. The originally proposed program goals and objectives for the REMGRFP have been met with outstanding perseverance, commitment, and a measurable amount of success. The program had an original goal of graduating Ph.D. fellows after three years, and its goal was realized in a timely manner with the graduation of the three African-American fellows. Fifteen (15) Ronald E. McNair fellows (REMGRFP) who have earned their Ph.D.s at NC A&T are as follows:

<b>Name</b>	<b>Ph.D. (Year of Graduation)</b>	<b>Current Employer</b>	<b>Dissertation Title / Advisor</b>
Alfred Burress	EE (1998)	IBM	Logic Design for Self-Checking FPGA Based Systems / Dr. P.K. Lala
Sidney Bryson	EE (1998)	Lucent Technologies	Cognitive Visual Systems Incorporating Stereopsis / Dr. Gary Lebby
Christopher Grace	ME (1998)	General Electric	Experimental & Analytical Behavior of Tensile Preloaded Composites Subjected to Low Velocity Impact / Dr. Ajit Kelkar
Michael Cooke	EE (1999)	Self-Employed	A Cellular Wireless Power System Architecture / Dr. Gary Lebby
Karl Ricanek	EE (1999)	Corning	Face Recognition Under Various Pose Articulations / Dr. A. Homaifar
Aaron Cozart	ME (1999)	Pratt and Whitney	Aero-Thermochemical, Thermal and Structural Analysis on Ablative Composite Rocket Nozzles / Dr. Kunigal Shivakumar
Larry Russel	ME (2000)	Army Research Office	The Effect of Thermal Barrier and Surface Modification Coatings on the Performance of Ceramics and Ceramic Matrix Composites / Dr. Jag Sankar
Jerry Lang	ME (2001)	NASA-Langley	Mechanical Behavior and Analytical Modeling of Melt-Infiltration SiC/SiC Ceramic Matrix Composite / Dr. Jag Sankar
Michael King	EE (2001)	National Security Agency	Multi-Context Spoken Language Command Identification Using Hierarchies of Adaptive Neural Experts / Dr. Gary Lebby
Mark Kithcart	ME (2001)	NC A&T	Numerical Study of the Localized Effects of Dimple Roughness on Heat Transfer in Turbulent Boundary Layer Flow / Dr. David Klett
William Martin	ME (2001)	Naval Undersea Warfare	An Artificial System for Structural Health Monitoring / Dr. Mark Schulz
Derke Hughes	ME (2001)	Naval Undersea Warfare	Low Velocity Impact Resistance of Organic Foam Core Sandwich Composites / Dr. Mark Schulz
Eddie Branch	EE (2002)	Raytheon	Control Design for Dual Track Seeking and Following of a Magnetic Disk Drive / Dr. Marwan Bikdash
Roderick Henderson	EE (2002)	IBM	A Scalable Framework for Distributed State Sharing / Dr. John Kelly
Walter Gilmore	EE (2002)	NC A&T	Magnetoresistive Materials and Ferroelectric PZT Thin Films on Si<100> / Dr. Clinton Lee

In addition to these 15 fellows, eleven students (6 – EE & 5– ME) have been awarded Ph.D. degrees in either Electrical Engineering or Mechanical Engineering since 1998 as shown in Appendix - A.

According to the latest report by the Division of Science Resources Studies at the National Science Foundation, only eighty-three (83) African-Americans received doctoral degrees in all engineering disciplines in 2000. NC A&T awarded a total of 26 degrees, including 16 African-Americans, in only two engineering disciplines over the past 4 years. It clearly indicates that the partnership between NASA and NC A&T plays a significant role in producing minority engineering Ph.D.s, which this country needs to establish an ethnically diverse workforce to compete in a global economy. Many of these students would not have been able to study for their doctoral degrees without the Ronald E. McNair Graduate Research Fellowship Program.

## 2.1 Fellows' Scholarly Activities

Current and future program strength is and will be determined by the quality of doctoral students produced by North Carolina A&T State University. The quality of the original three doctoral graduates is of a caliber that gives honor to their degrees, the university, NASA and the nation's workforce. Numerous Fortune 500 companies have aggressively recruited them. Their options for employment were varied. Along with the recognition of a NASA funded program and the reputation of the College of Engineering, many options were available. The present and future impact of their choices can only add to the recruitment efforts of the program. The Ph.D. candidates' accomplishments for the past 3 years at A&T is summarized as follows:

### The PhD Candidates' Accomplishments for the Past Three Years

Description	Amount or Numbers
Doctoral NASA fellows supported	34
Doctoral NASA fellows graduated	15
Increase the numbers of Ph.D. candidates from 35 to 53 at the College of Engineering	35 in 1997 to 53 in 2002
Total Ph.D. candidates graduated at the College of Engineering	26
Publications: journal or conference proceeding papers	36
Oral presentations at professional meeting: single / joint	24
Number of travels for professional development, seminars, workshops & presentations	37
Number of Ph.D. candidates visited NASA research centers during summer	6
Number of Ph.D. candidates visited others research labs	10
Number of fellows receiving job offers	100%
Average length of studies	4.2 Years

## 2.2 Fellows' Intern Experiences

The Ronald E. McNair Graduate Research Fellowship Program (REMGRFP) encourages its fellows to conduct their research at NASA, at a national research laboratory or an industry for at least one summer. It certainly provides them an opportunity to apply their academic knowledge to practical problems as well as broaden their scope. Fellows have gained meaningful practical experience through internships while they are working for their doctoral degrees. Some examples are as follows:

- Eddie Branch (IBM Research Center in San Jose, California)
- Hilda Goins (NASA-Langley Research Center)
- Roderick Henderson (IBM, Research Triangle Park, North Carolina)
- Vendetta Knight (NASA-JPL)
- Williams Martin, III (Sandia National Laboratory)
- Larry Russell (NASA-Glenn Research Center)
- Lee Emmanwori (Center for Composite Materials at University of Delaware)
- Woodrow Winchester (Honeywell, Minnesota)
- Misty Blue (Army Research Laboratory, Aberdeen Proving Ground, Maryland)

Specific summer research activities of the fellows are listed in Appendix – B.

## 2.3 Current Fellows

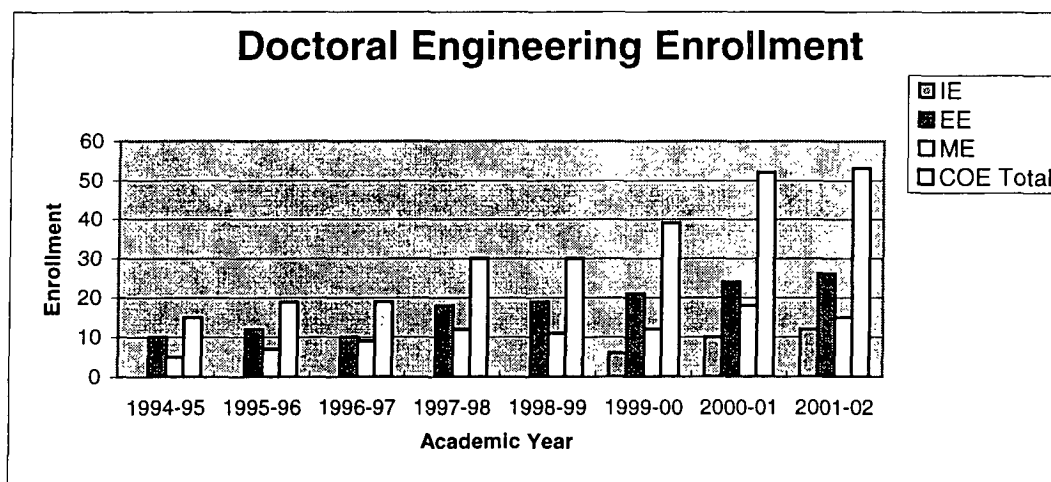
Listed below are the McNair Fellows for the 2002-2003 academic year:

Name	Major	Starting Year	Advisor
Lee Emmanwori	ME	Spring 1998	Dr. Kunigal Shivakumar
Cynthia Waters	ME	Spring 2001	Dr. Jagannathan Sankar
Justin Foreman	EE	Spring 1998	Dr. Chung Yu
Katherine Stevenson	EE	Fall 1999	Dr. Gary Lebby
Felecia Williams	EE	Fall 1999	Dr. Gary Lebby
Cortney Bolden	EE	Spring 2002	Dr. Y. D. Song
Tyesia Pompey	EE	Spring 2002	Dr. Jung Kim
Terry Miller	EE	Fall 2002	Dr. John Kelly
Douglas McWilliams	IE	Spring 2000	Dr. Paul Stanfield
Michelle Squire	IE	Fall 2000	Dr. Christopher Geiger
Woodrow Winchester	IE	Fall 2000	Dr. Celestine Ntuen
Caroline Moineau	IE	Fall 2001	Dr. Paul Stanfield
Misty Blue	IE	Fall 2002	Dr. Celestine Ntuen

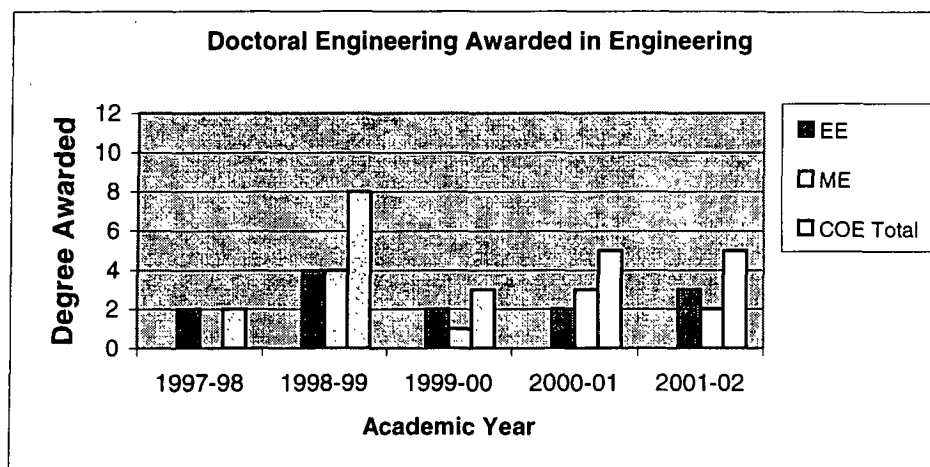
As the Ph.D. in Industrial Engineering is a newly established program, the College of Engineering supported more Industrial Engineering students in order for the program to be established on solid ground. These fellows are currently receiving an \$1,800 monthly stipend and their full tuition. Six of these fellows are out-of-state students, and NC A&T pays their out-of-state tuition (\$9,087) as matching funds, which indicates NC A&T's commitment toward building solid Ph.D. programs.

### 3. STATUS OF THE COLLEGE OF ENGINEERING DOCTORAL PROGRAMS

There are fifty-three (53) students currently enrolled in the Ph.D. programs: 26 in Electrical Engineering, 12 in Industrial Engineering and 15 in Mechanical Engineering. Twenty-six (26) Ph.D. candidates, including sixteen (16) African-Americans, completed their degrees during the past 4 years. The University received permission from the University of North Carolina System to implement a new Ph.D. program in Industrial Engineering in its master plan. Industrial Engineering has implemented their program since January 2000 and currently has twelve Ph.D. students. The various projects seek funds to assist with the planned implementation of this new industrial engineering doctoral level degree program. Doctoral engineering enrollment in the Electrical, Industrial, and Mechanical Engineering Departments for the last eight years is given below.



Doctoral degrees awarded in Electrical and Mechanical Engineering Departments for the last five years is given below:



#### 4. SUMMARY

Establishment of the Ronald E. McNair Graduate Research Fellowship Program (REMGRFP) has provided the catalyst for a dynamic venture that allows the University to recruit, retain, and graduate increasingly larger numbers of socially and economically disadvantaged minorities from its doctoral programs. Some of the major benefits provided by this Fellowship are as follows:

1. Allowed North Carolina A&T State University to produce 16 African-American Ph.D.s during the past five years, which is a significant portion of the African-American Ph.D.s produced in the entire nation.
2. Allowed the University to recruit more and better quality minority students, which enhances the quality of NC A&T doctoral programs.
3. Allowed NC A&T an opportunity to develop post-doctoral research programs that enhances the faculty recruitment program.
4. Allowed NC A&T an opportunity to build a fine mentorship program as all of the fellows actively participate in this program.

In conclusion, North Carolina A&T State University is committed to building competitive graduate programs. The College of Engineering has been the number one producer of African -American engineers at the BS level for many years. With the help of NASA, it is our goal to be the number one producer at the Ph.D. level in the next 10 years. With the 26 doctoral students, including the sixteen African-Americans we have graduated during the past 5 years, we feel confident that NC A&T State University will achieve its goals if excellent external support like NASA's REMGRFP continues.



## **APPENDIX – A: Doctoral Graduates Who Were Not Ronald E. McNair Fellows**

Listed below are Ph.D. graduates who were not supported by the Ronald E. McNair Fellowship during the past four years:

### **Doctoral Candidates Graduated:**

1. **Jesse Munchai, Ph.D. in Mechanical Engineering (2002)**  
Dissertation Title: "Finite Element Analysis of a Thermal Barrier Coated Diesel Engine Piston," Advisor: Ajit Kelkar
2. **Zhigang Xu, Ph.D. in Mechanical Engineering (2002)**  
Dissertation Title: "Liquid Fuel Combustion Chemical Vapor Deposition of YSZ Thin Films For Fuel Cell Applications," Advisor: Dr. Jagannathan Sankar
3. **Bahram Kimlaghaham, Ph.D. in Electrical Engineering (2002)**  
Dissertation Title: "Development of Control Methodologies for a Shipboard Crane," Advisor: Dr. Abdollah Homaifar
4. **Yongkab Kim, Ph.D. in Electrical Engineering (2001)**  
Dissertation Title: "Brillouin-Active Fiber Rings for Optical Logic and Neutral Applications," Advisor: Dr. Jung Yu
5. **Yaxi-Shen, Ph.D. in Electrical Engineering (2001)**  
Dissertation Title: "Development & Assessment of Active Control Methods for Vibration Minimization in Flexible Structure," Advisor: Dr. Abdollah Homaifar.
6. **Felix L. Abali, Ph.D. in Mechanical Engineering (2001)**  
Felix L. Abali, "Resin Transfer Modeling Based Carbon-Carbon Composites," Advisor: Dr. Kuginal Shivakumar
7. **Steven Smith, Ph.D. in Mechanical Engineering (2001)**  
Dissertation Title: "Vacuum Assisted Resin Transfer Molding Processing, Evaluation, Fracture Testing and Analysis," Advisor: Dr. Kuginal Shivakumar
8. **Mohuddin Ahmed, Ph.D. in Electrical Engineering (2000)**  
Dissertation Title: "A Novel Approach in Power System Protection Relay Using Pattern Classifier Artificial Neural Network," Advisor: Dr. Gary L. Lebby
9. **Pramod Chaphalkar, Ph.D. in Mechanical Engineering**  
Dissertation Title: "Performance Evaluation and Modeling of Twill Woven Laminate," Advisor: Dr. Ajit Kelkar
10. **Jalal Baghdadchi, Ph.D. in Electrical Engineering (1999)**  
Dissertation Title: "Growing a Knowledge Base for Intelligent Agents," Advisor: Dr. Abdollah Homaifar.

**11. Zia Salami, Ph.D. in Electrical Engineering (1998)**

Dissertation Title: "Controlling Power System Transients Using Machine Intelligent Transient Analysis and Control System (TACS) Modules," Advisor: Dr. Gary L. Lebby.

## **APPENDIX - B: Summary of Summer Activities**

### **Summer of 2002**

**Felicia Williams:** Electrical Engineering, Advisor - Dr. Gary L. Lebby

During the summer, Mrs. Felicia R. Williams worked on her dissertation, "Very Fast Simulated Annealing for Optimal Power System Economic Dispatch." The majority of her time was spent gathering data, analyzing various approaches, and seeking appropriate software.

**Katherine Stevenson:** Electrical Engineering, Advisor - Dr. Gary L. Lebby

Activities: Gathering research, material fuzzy maps practice using visual basic 6.0 software, recording FORTRAN algorithm to a mat lab algorithm. Analysis of data using neural network such as: (GRNN) generalized regression Neural Network perceptron also using SVM support vector machine.

**Cortney Bolden:** Electrical Engineering, Advisor - Dr. Y. D. Song

Some of the tasks performed this summer include writing and publishing two papers and presenting a paper at a conference. The first paper entitled, "Fault-tolerant control of composite systems with faulty dynamics," was published in the Proceedings of ACUN-4 "Composite Systems-Macrocomposites, Microcomposites, Nanocomposites," which took place July 21-25, 2002 in Sydney, Australia. In summary, the paper focused on the role of automatic control in the development and analysis of neural network based vibration control algorithms for composite structures with faulty dynamics. The control algorithms were given and discussed in detail and simulations were shown to validate results. The second paper was titled, "Control Scheme for Landing a Space Vehicle," which is a starting research focus for my dissertation. It is being published in the Electro technology Symposium, which is being held in San Juan, Puerto Rico, November 13-15, 2002. Finally, a presentation was given at the World Automation Conference in Orlando, Florida on behalf of NASA CAR. The paper was titled, "The Design and Analysis of Optimized Aircraft Wing Structures Using Fluid-Structural Interactions."

**Justin Foreman:** Electrical Engineering, Advisor - Dr. Chung Yu

The activities for this summer related to the development of a stable Brillouin fiber ring sensing system have included the following:

1. Initiation of stimulated Brillouin scattering (sBs) threshold experiments in studying threshold behavior.
2. Participation in writing effort for the Asian Pacific Optical Conference.
3. Participation in the Regional Research Conference on Mathematical Methods in Nonlinear Wave Propagation, May 15-19<sup>th</sup>, in which I delivered an oral presentation.
4. Investigation of software solution to system of nonlinear partial differential equations
5. Continuation of literature review and proposal writing in preparation for preliminary exam.
6. Completion of a book on the diode-pumped solid state laser, which is a central component in my research, for a book review.

**Tyseia L. Pompey:** Electrical Engineering, Advisor – Dr. Jung Kim

Digital signal processing has introduced a new computational and visual tool for bimolecular analysis. Color maps can help in visually identifying protein coding areas for both DNA strands, including reading the frames of each of the exons. The colored spectrograms can visually provide significant information about bimolecular sequences, thus facilitating understanding of local nature, structure and function. A digital filtering approach to the genetic code translating nucleic acids into proteins will be presented, in which each amino acid is represented by a properly assigned complex number. Such an approach may result in alternative numerical formulations and improved computational techniques for the solutions of useful problems in bioinformatics. My main summer activity was to conduct the above research including literature surveys and simulations using Matlab for the genome data analysis.

**Cindy Waters:** Mechanical Engineering, Advisor - Dr. Jagnathan Sankar

This summer I took a class from NC State while starting to work with the experimental systems I will be using. I worked with Dr. Kumar with the Pulsed Laser deposition system. I also worked on a new heater design to decrease the distance to the target, in situation. In addition I have submitted a paper which was presented at the 9th International Conference on Composites Engineering (ICCE-9) in San Diego. I have been studying the current literature and am learning the technique for TEM sample preparation, and the procedures for the surface profilometer to determine film depth.

**Legunchim Emmanwori:** Mechanical Engineering, Advisor - Dr. Kunigal Shivakumar

This summer I put all of my efforts on completing my dissertation entitled: "Intrusion of Embedded Fiber Optic Sensor on Structural Integrity of Composite Laminate." My study was the effect of embedded FOS on strength and fatigue life of composite laminates fabricated by conventional process. I expect to defend my dissertation in September 2002.

**Woodrow Winchester:** Industrial Engineering, Advisor – Dr. Celestine Ntuen

This summer I worked at Honeywell in the following tasks:

1. Supported interface design and development for a web-based home and activity monitoring system for the elderly, ILSA. This was a NIST funded research project supporting elder independence.
2. Led implementation efforts at initial ILSA test site in Stillwater, MN. Developed and delivered first round of user training.
3. Supported requirements definition in the conceptual design of integrated aircraft alerting guidelines.

This effort was documented in the technical report, entitled "Alerting and Notification of Conditions Outside the Aircraft (ANCOA): Integrated Alerting Guidelines and Conceptual Design," Technical report prepared for NASA Langley Research Center under contract NAS1-00107.

**Misty Blue:** Industrial Engineering, Advisor – Dr. Celestine Ntuen

The majority of the summer of 2002 was spent doing speech intelligibility research at the United States Army Research Laboratory. Most military communication systems contain at least a small amount of noise or interference during communication. An experiment was designed and implemented to determine the effects of different types of noise and signal to noise ratios on speech intelligibility using the Callsign Acquisition Test. Also during this time period I took a course in Acoustics.

**Kaize Adams:** Industrial Engineering, Advisor – Dr. Daniel Mountjoy

The summer was spent performing a literature review for possibilities of a research topic for my Ph.D. The literature review focused on the areas of virtual environments, spatial awareness, and cognitive modeling. I also presented a paper, "Pilot Skill Learning in Non-immersive and Immersive Virtual Environments" at the annual IIE IERC Conference, held in Orlando, FL, May 18-23, 2002. Time was also spent during the summer preparing for qualifying exams for Fall 2002.

**Douglas McWilliams:** Industrial Engineering, Advisor - Dr. Paul Stanfield

Over the summer of 2002, I furthered my research study dealing with scheduling inbound trailers at receiving dock doors in order to reduce the amount of time required to complete the sorting operation. I developed two analytical models of sorting and applied the models to various small size problems using a branch-and-bound algorithm. Due to the computational complexity of the problem, exact solutions could only be found for problem instances up to fifteen trailers. Therefore, I developed a heuristic procedure which I call the Dominance Balance Assignment Algorithm and a meta-heuristic procedure which I call Genetic Dominance Balance Assignment Algorithm. Both methods proved successful in finding solutions for larger problem instances. Also, I have been an active member of the ISE Undergraduate Retention Coordinator for the ISE Tutorial and Mentorship Program.

**Michelle L. Squire,** Industrial Engineering, Advisor – Dr. Christopher Geiger

During the summer, I worked on developing my dissertation topic "Mapping Scheduling Rules to Problems." This work involved extensive literature review and learning C++. A large amount of time was spent documenting the development of this research topic. Also, I have been working with the ISE Undergraduate Retention Coordinator for the ISE Tutorial and Mentorship Program.

### **1999 - 2000 Summer Research Activities**

**Eddie Branch:** Electrical Engineering, Advisor – Dr. Marwan Bikdash

I conducted 8 weeks of research at the IBM Research Center in San Jose, California in the development of Fuzzy Logic Control Applications to Direct Access Storage Devices (DASD) for Hard Drive, Floppy and Tape Drives. I performed research off-site under the leadership of my faculty advisor.

**Chandra V. Curtis:** Electrical Engineering, Advisor – Dr. John Kelly

Chandra Curtis spent the summer participating in an investigative approach in familiarizing herself with XML. This was a self-initiative approach by the fellow to determine the usefulness of XML with efficient computer algorithms for implementation in hardware. Chandra states that " spending time to understand XML Spy (XML editor), MSXML parser, Mozilla XML Parser, and the XML4C (C++XML Paser, was very beneficial to my planned Ph.D. research project". She spent approximately 2 weeks at IBM with a research team studying XML under the advisement of her faculty advisor, Dr. Feodor Vainstein.

Chandra spent time mentoring students in Calculus the latter portion of the summer. She spent time volunteering with the Summer Special Olympics and the North Carolina Food Bank. She is very diverse in her studies, research and active volunteerism. She is actively involved in community activities relating to underprivileged and underserved youth.

**Lee Emmanwori:** Mechanical Engineering, Advisor - Dr. Kunigal Shivakumar

Lee Emmanwori spent a portion of the summer at NCA&TSU and a portion at the Center for Composite Materials at the University of Delaware to investigate the Vacuum Assisted Resin Transfer Molding Process (VARTM). Lee conducted research on the campus, under the advisement of his faculty advisor, Dr. K. Shivakumar, in the following areas: .

- Fabricated glass/vinylester laminates and sandwich panels.
- Tension testing on fabricated panels for material characterization.
- Studying types of embedded sensors and the embedding process
- Investigated data acquisition "smart weaves" analysis and data interpretation

Lee began preparation for the qualifying exams during fall semester 1999. He is excited about a possible joint research collaboration with the University of Delaware with the CCMR group.

**Walter Gilmore:** Electrical Engineering, Advisor – Dr. Clinton Lee

Walter spent the summer performing equipment automation with his faculty advisor, Dr. Clinton Lee. Walter was successful in preparing equipment that will allow him to acquire data automatically for his research area, for impedance, inductance and capacitance measurements for superconducting thin films of interest. Time was also spent on preparing for the qualifying exams for fall 1999. Walter is actively involved with mentoring and tutoring in the Electrical Engineering department and the campus Graduate Engineering Student Association (GESA).

**Hilda Goins:** Electrical Engineering , Advisor – Dr. Gary Lebby

Hilda Goins spent 10 weeks during the summer at NASA Langley Research Center performing research with Dr. Marc Butin and Dr. Mark Motter in the analysis of EEG signals obtained by using the MAT Protocol. Hilda was involved in creating a synthetic pilot environment to stimulate various conditions that correlate to an individual's workload or stress level. The fellow completed a program using MATLAB's Neural

Network toolbox that will be used to train the neural network to distinguish workload levels from features of the collected EEG data.

Hilda worked in a second part research experiment with Dr. B. McKissick performing research on data that associates three-directional velocities with the Eddy Dissipation Currents. Fellow was assigned to reach a consensus on the wavelet representation of the results. Hilda has reported that this was one of the most meaningful research experiences she has had the opportunity to become a part of. She is certain that the opportunity to work with such a diverse and research oriented group gave her much appreciated insight into the Signal Processing field. This experience has assisted her in selecting her dissertation research topic.

**Roderick Henderson:** Electrical Engineering, Advisor - Dr. John Kelly

Roderick spent 10 weeks during the summer at IBM in Research Triangle Park, North Carolina. While at IBM conducting research, Rod wrote a paper titled "A Taxonomy of Network Transcoding". The paper has been submitted to the IST/SPIE's (Society of Optical Engineering) 12th Annual International Symposium. The preparation of the paper facilitated the fellow's literature search experience and helped him focus on specific topics. Rod plans to utilize his research and writings to get a head start on developing network transcoding prototypes for his planned Ph.D research and dissertation project.

Rod is also involved in the establishment of a transcoding laboratory in the Electrical Engineering Department. Rod is a recent Air Force Captain and chose to put his military career on hold, while pursuing his Ph.D. Degree.

**Derke Hughes:** Mechanical Engineering, Advisor – Dr. Mark Schulz

Derke Hughes spent the summer on the campus performing research with faculty advisor, Dr. Mark Schulz, in the Structural Dynamics and Controls (SDC) Laboratory. Derke used new state of the art techniques in Wavelet Analysis with emphasis on Mechanical Signal Processing. His focus area was in testing aluminum cantilever beams and gathering valuable research data. The fellow completed his Ph.D. qualifiers during Spring Semester 1999.

**Mark Kithcart:** Mechanical Engineering, Advisor – Dr. David Klett

Mark Kithcart spent the summer on the campus of NCA&T completing dissertation research and the modification of the subsonic wind tunnel. Following modifications, fellow was able to perform preliminary test runs on a partially instrumented dimpled cylinder. Mark was able to test the latest version of Fluent CFD (Computational Fluid Dynamics) software on a new 500 MHz PC. Fellow has initiated the [mal phase of his dissertation research using full three- dimensional numeric model with the assistance of the new CAD (Computer Aided Design) grid generation software included in the Fluent Software Package.

Mark has plans to complete research and writing of his dissertation by December 1999. His research was stalled due to the prolonged acquisition process of essential software necessary to complete CFD testing.

**Vendetta Knight:** Electrical Engineering, Advisor - Dr. Eric Cheek

Vendetta Knight performed joint research between NASA-JPL and NCA&T with the assistance of her faculty advisor, Dr. Clinton Lee. Vendetta's JPL site research was under the supervision of Dr. Siamak Forouhar of the Photonics Technology Group in the Microdevices Laboratory. The fellow performed research on two projects during the summer. The first project involved research in the development of safe, and more efficient methods of back thinning Inp Wafers that is currently being employed by the research group. The second assignment involved learning to use OWMS (Optical Waveguide Mode Simulator) and ALDS (Advanced Laser Diode Simulator) to simulate the performance of waveguides and lasers, respectively. The fellow's faculty advisor spent time on site with the fellow in the development of this research. The research is an ongoing effort between NCA&TSU and NASA-JPL.

**William Martin. III:** Mechanical Engineering, Advisor – Dr. Mark Schulz

William Martin, III spent the summer at Sandia National Laboratories, Albuquerque performing research on a joint project with Sandia and NCA&T. William worked under the supervision of Technical Advisor, Dr. Todd W. Simmermacher in the research area of error detection of the LDV (laser Doppler Vibrometer) software. The fellow performed research in developing methods to circumvent the mathematical errors that cause transformation of information to be incorrect, by using MA TLAB. The summer research work focused on integrating and expanding existing graphic interface with the existing registration algorithm into a user-friendly MATLAB script file.

**Mary Murdock:** Mechanical Engineering, Advisor - Dr. Mel Human

Mary Murdock spent a portion of the summer on the campus of NCA&T and a portion completing a professional development training course in Computational Fluid Dynamics in San Francisco, California. Dr. Suhas V. Pantankar, the author of the book Mary is currently using for investigating and writing code to obtain numerical solutions for her dissertation research, taught the course. The fellow is currently researching methods to determine governing equations for flow in porous structures. Mary spent a portion of her summer volunteering for the Saturday Academy Activity. She is very active with community youth and at-risk teens.

**Larry Russell:** Mechanical Engineering, Advisor - Dr. Jagannathan Sankar

Larry Russell spent a portion of the summer at the NCA&TSU campus under the advisorship of faculty advisor, Dr. jag Sankar and a portion at NASA Glenn Research Center under the NASA Technical Advisorship of Dr. Robert A. Miller. Larry spent two weeks of intense research collaboration at the NASA Glenn Research Center, in Ohio with the Environmental Durability Branch. The fellow has developed the joint collaboration that will be beneficial in completing his dissertation research and composition. The experimental investigation consisted of studying the load-displacement behavior of virgin to thermally soaked to coated materials, modulus variations, with coating thickness, and understanding the failure mechanisms odd SiC/SiC composites during four-point bend testing. Larry will spend the fall of 1999 completing his research and composing his dissertation.




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14. ABSTRACT According to the latest report by the National Science Foundation, only eighty-three (83) African-Americans received doctoral degrees in all engineering disciplines in 2000. North Carolina A&T State University (NC A&T) awarded Ph.D.s to 15 African-Americans, in only two engineering disciplines over the past 4 years. It clearly indicates that the partnership between NASA and NC A&T plays a significant role in producing minority engineering Ph.D.s, which this country needs to establish an ethnically diverse workforce to compete in a global economy. Many of these students would not have been able to study for their doctoral degrees without the Ronald E. McNair Graduate Research Fellowship Program.					
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